

Way finding and needs of map users from Indigenous to ICT Knowledge application: a comparative analysis of rural and urban societies of Serowe in Botswana and London in the United Kingdom

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Abstract

This paper provides a comparative analysis and differences on map users' needs and trends in rural and urban societies over time using examples from Serowe village in Botswana and the city of London in the United Kingdom (UK). This study employs reconstruction of historical landscapes using indigenous knowledge and the application ICT in map development. The results shows that rural folks found their way around by employing indigenous knowledge on positions of heavenly bodies, natural phenomena such as the westerly winds and other visible celestial makers. This has led to the development of a precise symbolic language among the rural folk. This work shows that map use in some rural African communities, is not common as there is no need for maps, as there are alternative for ways for finding ones position without recourse to a map. These alternative ways have developed because of the needs of the indigenous peoples some of which continue to this day as form of maps. The paper demonstrates that new information computer technologies (ICT) can augment indigenous knowledge practices on way-finding. In the two case studies map utilization among the Serowe populace is nonexistent, even the most literate do not use maps. On the contrary, the urban people of London cannot do without a map for their way finding. This phenomenon is reflected by the availability of many different types of maps for different use and application. The evolution of maps use is a reflection of societal development with African rural population relying on symbolic way-finding, the same way their forefathers used to practice; whereas the urban people go to formal schools to learn how survive in the modern environment. In rural societies maps are utilised by government in service provision and infrastructure development as is the case everywhere in the world, save for individuals. The differences in the use and appreciation of maps in rural Botswana and urban city of London, is primarily a function of differences in the development space of the two areas.....

The Introduction

Maps are part of day to day life since they were created. Historical information show that early maps comprised Babylonians map-like images on clay tablets; some early Chinese cave and tomb art with map-like characteristics, and maps an map-making has have redefined man's history and civilization as the age of discovery was based on the use of precise maps and an understanding of astronomy. The new maps of the 20th century are based on source maps made thousands of years earlier (Hancock, 1995). For example, the Antarctica maps of Orenteus Finaeus, and which were later drawn by Piri Reis, Gerard Kremer (Mercator), and

Philippe Bauche show Antarctica as it must have looked before it was covered with ice (Hancock, 1995). Similarly, the Egyptian map of 1150 BC on papyrus is not their first map either. Hancock, in his book *Fingerprints of the Gods, a quest for the beginning and the end* (Hancock, 1995) show that what has come to be known as the ancient Egyptian pyramids is actually a symbolic map of the heavens as they were during the times the pyramids were built in 10450 BC. The Giza's pyramids were built to represent Orion's Belt on the ground. Whereby, in this symbolic map, the meridional course of the Nile Valley was used to depict the Milky Way constellation as it looked in then. The three Giza's pyramids were built to represent the three stars of Orion's Belt, exactly as they looked then. The Great Pyramid representing Al Nitak, the pyramid of Khafre represent Al Nilam, the middle star; whereas, the pyramid of Menkaure which is offset representing Mintaka which is also slightly offset to the east of the principal diagonal formed by the other two stars in Orion's constellation. And that the pyramids are in exactly the same relationship to the Nile valley as the three stars then had been to the Milky Way – so, a particular epoch is frozen into this architecture (Hancock, 1995). Hancock (1995) concluded that an ancient knowledge of spherical geometry and astro-navigations existed in ancient times. He went on to say that at that time – 10970 to 8810 BC, the sun, on the vernal equinox rose in the constellation of Leo. And that on the ground the Sphinx of Giza which represent a lion was built as an equinoctial marker of that epoch on the ground (Hancock, 1995).

Maps and their types

Also, it has not conclusively been decided what a map is really is. It is defined in many ways by different cartographers. Robinson et al in their book *Elements of Cartography*, which spans many decades and know international by cartography scholars as the 'cartographic bible' has defined it as the graphic representation of the geographical setting (Robinson, 1995) and Thrower, an authority on the history of cartography (Thrower, 2008) define it as a representation, usually on a plane surface, of all or part of the earth or some other body showing a group of features in terms of their relative size and position. Other cartographers define it as a reduced image to a given scale of a place at a particular point in time, and its contents have been selectively generalised to focus on one or two particular themes.

All aspects geo-spatial information systems (GIS) endeavours, within the of modern day age of information computer technology (ICT) are dependent on maps in their procedures. Viewing and exploring graphical data can only be done on a map base: it could be from a

vector map, a space map or an orthophoto map. The GIS dependency on maps is reflected in the way in which its integration of datasets from different sources, its transforming of data into different coordinates systems, and its different representations are done in a map medium. Querying and analysing attribute dataset for GIS is also possible only when it is done within map layers of a given place at a particular time. And, in the end, the results of GIS are given in the form of maps.

It is important to note that in this ICT age, it is not only the maps creation the cartographers have to contend with; map users have become sophisticated as well. They are not satisfied by only knowing how to get from point A to point B and knowing how the land look like along the way and over there. All was depicted by old fashioned maps need to be redefined. Modern day map users want much more, for instance: they would like to know about the terrain, the geology, what types of soils and their suitability to crops, who are the occupants of a certain area, what are their political preferences, what soccer teams played last at a particular stadium, which team was the victor and what the score was and so on and so forth. These show that map making is driven by the map users and their needs. The user's needs are driven by their culture and this is determined by whether the populace is rural or urban.

On the other hand, the quest for information interrogations could be satisfied by the GIS which have put maps and other kinds of spatial information into digital format. Also, looking at data which is in a digital format geographically can often suggest new insights, and better explanations. So, invariably, GIS has become an ICT age modern map.

But, map users need to tread very carefully when interacting with these modern maps as the ease of GIS mapping causes a dilemma as computers enable armature in cartography to produce a large number of beautiful erroneous maps very quickly. So, authenticity of the map and its authorship is an important factor before modern maps could be used.

It has been the norm over many decades that the general map needs in the form of base maps, topographical maps, nautical and aeronautical navigation charts are created by cartographers. These cartographers are typically employees of large government organizations, like the USGS for the USA maps, the Ordnance Survey for the UK, and the IGN for the maps of France, the Surveyor General for the maps of South Africa and the Surveys and Mapping for Botswana. Other countries had extra map making arms to map out specifically their overseas interest, example of which were the Directorate Overseas Survey for the UK and **IGNfi** for France. These cartographers make maps with highly specialized equipment at carefully

defined tasks including surveying, drafting, GIS, remote sensing and printing. The maps they make are authentic as these cartographic experts adhere to strict standards, good results in precision and accuracy.

On the other hand, the other form of maps, the thematic maps are made from data interpreted from themes like sustainable natural resource use, political, social and physical patterns are made by scientists, university people, professionals, and researchers. These intellectuals use the experts' cartographers' data as their map base on which they overlay their information for the theme under investigation. These thematic maps are authentic as well because they emanate from the work of intellectuals based on the careful work of experts and therefore it impacts the knowledge base, and has the accuracy and precision of inherited from the technical experts.

The objective of this paper is to show that map production and its development are dependent on the map users' needs. The map users' needs on the other hand are driven by the prevailing culture of a place. There are many different types of cultures and culture space; but whether a populace is within a rural or an urban setting can make a significance impact on their map users' needs. So, this paper elaborates upon a comparative analysis in map users' needs between two societies, the rural Serowe populace in Botswana and urban London populace in the United Kingdom. The paper will show that although the origins of map production for both places have been born from the same cradle, The United Kingdom (UK): the Directorate of Overseas Survey (DOS) and the British Ordnance Survey (OS) respectively.

3. Case Studies- needs of map users

The two case studies below were designed to test how... ..using two communities at different trajectories of development. The first case-study of the Village of Serowe in Botswana, a country in southern Africa. Botswana, the then Bechuanaland gained independence from the UK rule in 1966 and the responsibility for mapping were taken over by the Department of Surveys and Lands (DSL), (now Department of Surveys and Mapping (DSM)) succeeded the DOS. During the past 20 years there has been technology transfer and DSM is sufficiently equipped and is a fledgling organization with OS traditions in mapping.

Forty years since the DSL stood as an entity it has metamorphosed into DSM, a fully fledged mapping organization with personnel, equipment and operations comparable to any high ranking international mapping agencies. But, unfortunately this could not be said about its populace map use culture. The major question is that why is the Serowe populace not proficient in their map users' needs unlike the London populace although they have similar map producing agencies at their disposal. This paper uses these two places to show that culture and the society make up, whether it is rural or urban greatly influences map users' needs and therefore its development by making a comparative analysis between the two places.

1 Rural and urban societies: historical diversity

The rural residents of Serowe, Botswana, pride themselves on the fact that they know their surrounding environment like the back of their hands, they know very well every feature of the terrain they traversed. The knowledge they have in finding their way around is reflected in the popular Setswana idiom, "*Motho gaa itsiwe ese naga*" (Nothing in the nature of our environment can ever elude us, except the cunning character of human beings). The rural children learn to find their way around and what is in their environment from a very early age. They learn how to navigate by using the direction of the wind and also their sense of smell, as each place has its own peculiar scent. For instance, if the children had been walking in the veld for what seemed an eternity, they would be stopped, at almost sunset, by a suggestion from one of them that it was time to return home before it got dark. Without further ado, the spokesperson would drop down in one knee, scoop a handful of sand, raise his hand and let the sand fall freely and slowly. As soon as the direction in which the sand blew became clear, all would shout almost simultaneously and say, the wind is blowing from this direction, so home is this way. Without being aware of it themselves; they knew which direction the south easterly or south westerly winds blew in respect to their village. During the day they were guided by the sun's position, and at night time, the moon and the stars were there for them to use to find their way around. Maps and compasses are not generally known to this rural people and this makes no difference. They make use of celestial bodies for direction to get around like the way their ancestors did before them.

There were people in the community whose jobs it was to observe the heavenly bodies and they could read the sky like a book and name most of the stars. They would even tell when an eclipse of the sun or the moon would occur. Although not everybody was expected to be that good and read the sky with such proficiency, everyone knew the basics, limited to knowing about the three prominent stars and their positions in the sky throughout the year. These are *Mphatalatsane*, the Morning Star and *Kopadilalelo*, the Evening Star and *Kgogamasigo*, the All-Night-Long Star. The positions of these indicate the times at night, *bosigo* and the seasons. During the day the rural people could tell time by using the position of the sun. The day, *Motshegare*, was divided into particular times i.e. *Mahube a naka tsa Kgomo*, dawn; *Tsatsi le thaba*, dawn - sunrise; *Motshegare wa sethoboloko*, noon; *Motshegare*, daytime; *Maitsiboa*, dusk - sunset *tsatsi le phirima*, evening and *Bosigo*, night-time. Any other time was indicated by pointing at the sky and showing exactly the position of the sun.

According to the British history, London's origin dates back to AD 50, and then it was known as the settlement of *Londinium*. It was a port and centre for shipping of crops and minerals. The London Bridge across River Thames was built then. The Romans rebuilt it after it was demolished by Queen Boedica of Norfolk and Suffolk, forty years later. It became the capital of Britain's provinces under Roman rule. Around AD 450, the city was taken over by the Saxons but little changed until AD 887. It was then rebuilt by King Alfred, the Great, and king of Wessex. The city was ruled through sheriffs and aldermen. Its first mayor was FitzAilwyn, who took office in AD 1189. Then, London was made an administrative district. In 1666 there was what the history books term *the Great London Fire*, when 60% of the city was destroyed. After the fire, it was rebuilt with brick and stone in preference to wood used before. By the 1670s the city's focus changed to become the centre of the British financial industry, a reputation it still holds today. It specialises in transactions, global markets and equities, which include fund management, banking, finances, insurance and business services. Manufacturing of printing, electronic engineering, food, drink and tobacco are other services which the city offers. The present Lombard Street is the relic of the original *bankers' street*, while Fleet Street was once the *newspaper and journalists centre*.

For the past 50 BP years the lives of people living in London have gradually changed and their existence has become more controlled with the creation of artificial environments in which tolerable weather simulations are set according to preferred air conditioner settings and they get their food in supermarkets. People seldom experience natural environmental

conditions as they stay in electrified air-conditioned houses and travel in a similar state in cars, buses or trains. They do not experience the environmental conditions by feeling but they do from readings on instruments, like clocks, thermometers and many others put in place to do those duties. They do not experience the landforms by their knowledge of terrain either, but they decipher the condition and the type of terrain they traverse by the guidance of instruments and maps. For direction they use a compass, for height and pressure they use a barometer, for landforms they will be guided by a contour map, for their position and altitude they will use a global positioning system (GPS) and for wind direction they will employ a wind gauge.

So urban people are expected to learn how to use these machines rather than to learn about and cope with the real world conditions themselves. A classical example could be the scene of an urban grandfather, sitting outside in the garden in London suburbia, being asked about the state of the weather, he might just go back into the house to turn on the television to check the weather screen before he answers. But if a rural grandfather in Serowe were to be asked the same question and he was indoors, he would go outside the house, look at the sky and tell about the weather conditions for the whole week just by studying his own environment that he knows well.

So the type of society in which one lives determines the awareness of the immediate state of the environment which is based on knowledge of local conditions. When such information would need to be recalled, possibly decades later in order to make deductions about land cover change, the rural folk would be more likely to be accurate in their recollections of their environments and how it had changed whereas to source such information for the urban areas, written records would possibly need to be consulted. Urban people could be totally unaware of what is happening around them until something big like global warming comes up. But the rural folks' experiences of the land cover change would possibly be more significant for them as it has a day to day effect on their everyday lives, which could make them more sensitive to their environment. These close-to-nature experiences could be lost as more settlements become urbanised.

Life experiences in rural areas can be indelibly recorded in people's brains and needs to be remembered. In order to record urban life experiences using various techniques, people would need formal schooling to learn about what is going on around them and to use the various techniques.

Botswana like many developing countries is undergoing rapid development and these means the tradition agriarian society described above become a modern or industrialized nation (Berliner, 1977). And once the people become moderninsed they become less directly dependent on their environment and less aware of how their area changes. They becomes more dependent on technology to tell them how their environment is changing. The main problem in developing counties is that the people will adopt modernization but on the other hand they will not afford to financially sustain the technology. In some ways the theories that the causes and effects of development are modernization, urban bias and economic dependency (Bradshaw, 1987).

2 Rural and urban societies: dependency on cartographic maps

In this section of the paper we bring in the issue of cartographic maps which include topographical maps (a map showing natural features like relief and manmade features) and thematic maps like geological (map showing geological features) and hydrological maps (showing hydrological features like rivers) just to name a few.

If the meaning of a map is explained in the simplest terms that **it is what they could use to find the way to their fields or to their friend's house**. They will just be baffled as *"they already know the way to their fields and the way to their friends' houses too"*. When 300 geomatics students in the city of Gaborone in Botswana were questioned on **what do they use to find their way around in the city** 81% said they use their cell phones to call or send text messages to find the directions from...; 10% say they ask for directions from the combi drivers (a pupolar mode of transport in Botswana), taxi drivers or from the public and 9% said they use Google Map. The last group were mostly foreign students and they also reported frustration because many streets in Gaborone have no names. It was also found that filling stations and schools are commonly used as landmarks when directions are given.

In London the usefulness of maps is apparent to any visitor who has just set his/her foot or even the residents. The tube map, in a form of a small square a quarter of a page in size, with many coloured lines drawn over each other like an electronic board was, and still is, an essential tool for taking the underground train (the Tube) for travelling within the city. The underground map is an abstract of reality, for example for one to travel and reach ones destination quickly and successfully, one need to know which line to take, its direction, and

from which platform to find it and its departure time. Also, there are maps for taking the red line buses from above-ground travels within the London city too, and maps for the green line buses bound for the suburbs. Maps are available for local trains and for the intercity, long distance train rides, going to places like Glasgow and Edinburgh in the north or Southampton and Brighton in the south of the United Kingdom too. Many trains leave for specific destinations from different train stations at particular platforms by the minute. Making a mistake might mean taking the three hours fast track, *the Flying Scotsman* to Edinburg, in the north with its first stop in Glasgow instead of a two hour ride to Wales. The guidebook, *London A to Z* is a useful commodity for finding places in that city sprawl. In London, initially a newcomer from rural Serowe in Botswana might experience a culture shock to find that using a map is a must. The truth is, although there are hundreds of people milling around, every one of them is in a rush, and no one has time to give directions. Newcomers just have to learn how to use maps themselves and help themselves to finding their own way around.

The differences between Botswana and the United Kingdom are vast. First, in Serowe people walk everywhere and they get to know their way around from an early age. Hence a map is not necessary for finding one's way around. If one has to travel to a new place one would most probably find someone who would either give directions; or failing which, if the directions are too complicated to comprehend, the person would take the visitor half way or all the way, the saying goes that "*there is no hurry in Botswana*". Also, in Botswana there is only one railway for passenger trains. It joins all major places from Ramatabama (the Botswana border post with South Africa) to Ramakgwebana (the Botswana border post with Zimbabwe), in the north. This railway formed part of "*Cecil Rhodes's dream, from Cape to Cairo railway link*". When going to Serowe, for instance, one would take the train to Palapye and from there, connects with the bus to Serowe.

Nowadays, it is a different story. Most areas in Botswana are connected by tarred road and there are slick buses and private cars to carry people to their destinations. Although plans and maps of different scales are now available, people still know their way around. Unlike in the United Kingdom, members of public in Botswana do not use maps much, they still use the old traditional ways of navigation. Maps are mainly used by government and other institutions as management and planning tools.

3 A Comparative Analysis of the Status of Mapping Development and its needs between the Rural Botswana and the UK

Table 3-1: A Comparative analysis of the status of mapping development and its needs between the rural Botswana and the UK

No.	Measured Item	Botswana		United Kingdom	
1	Total Land Area (km ²)	581730			
2	Total Population				
3	Person / Square Km				
4	% Land Urban				
5	Map format	Hard Copy	Digital	Hard Copy	Digital
6	% Area Large Scale Coverage				
7	% Area Medium Scale Coverage				
8	% Area Small Scale Coverage				
9	Number of Atlas				
10	How often Large Scale Maps Revised				
11	How often Medium Scale Maps Revised				
12	How often Small Scale Maps Revised				
13	How often Atlases Maps Revised				
14	Availability and Costs of Maps				
15	Availability Low and Medium Altitude Satellite Data				
16	Availability High Altitude Satellite Data				
17	Mapping, GIS and Remote Sensing Learning in Primary Schools				
18	Mapping, GIS and Remote Sensing Learning in Secondary Schools				
19	Mapping, GIS and Remote Sensing Learning in Tertiary Education				
20	Satellite Platforms and Sensors Country Ownership Participation				
21	GIS Software Country Ownership Participation				
22					
23					
24					

No.	Measured Item	Botswana	United Kingdom
25			
	Challenge		

4 Discussions and Conclusions

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